
VICTORIAN *E*NTOMOLOGIST

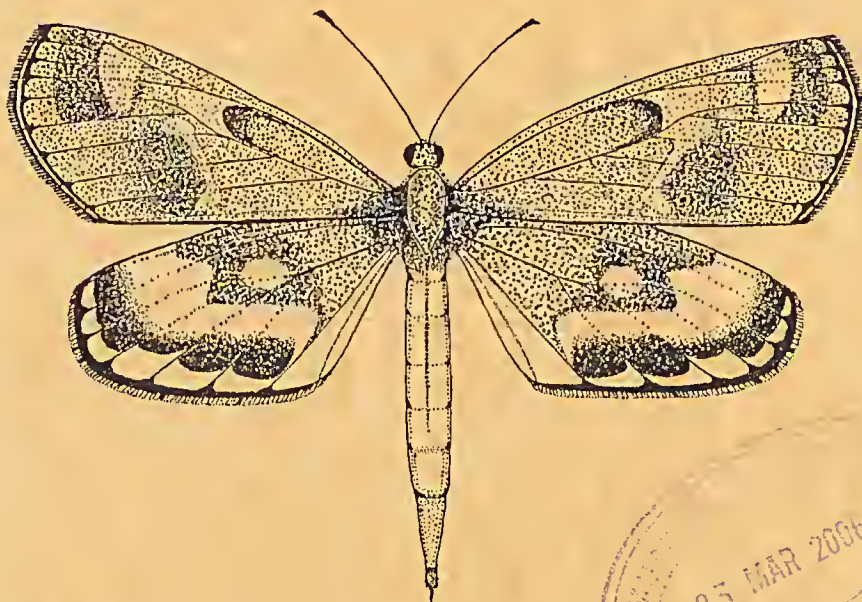


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News Bulletin of The Entomological Society of Victoria Inc.

THE ENTOMOLOGICAL SOCIETY OF VICTORIA (Inc)

MEMBERSHIP

Any person with an interest in entomology shall be eligible for Ordinary membership. Members of the Society include professional, amateur and student entomologists, all of whom receive the Society's News Bulletin, the Victorian Entomologist.

OBJECTIVES

The aims of the Society are:

- (a) to stimulate the scientific study and discussion of all aspects of entomology,
- (b) to gather, disseminate and record knowledge of all identifiable Australian insect species,
- (c) to compile a comprehensive list of all Victorian insect species,
- (d) to bring together in a congenial but scientific atmosphere all persons interested in entomology.

MEETINGS

The Society's meetings are held at 'InfoZone', Museum Victoria, Carlton Gardens, Melway reference Map 43 K5 at 8 p.m. on the third Friday of even months, with the possible exception of the December meeting which may be held earlier. Lectures by guest speakers or members are a feature of many meetings at which there is ample opportunity for informal discussion between members with similar interests. Forums are also conducted by members on their own particular interest so that others may participate in discussions.

SUBSCRIPTIONS

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|------------------|--|
| Ordinary Member | \$20.00 (overseas members \$22) |
| Country Member | \$16.00 (Over 100 km from GPO Melbourne) |
| Student Member | \$12.00 |
| Associate Member | \$ 5.00 (No News Bulletin) |

Associate Members, resident at the same address as, and being immediate relatives of an ordinary Member, do not automatically receive the Society's publications but in all other respects rank as ordinary Members.

Cover design by Alan Hyman.

Cover illustration: The pale Sun Moth, *Synemon selene* Klug, is an endangered species restricted to perennial grassland dominated by *Austrodanthonia* in Western Victoria. It is now extinct in SA, and was presumed extinct in Vic. until its rediscovery, in February 1991, by the late Frank Noelker and Fabian Douglas. The Victorian Populations are parthenogenetic with all specimens comprising females, a most unusual trait in the Castniidae. Illustration by Michael F. Braby.

MINUTES OF THE GENERAL MEETING 18 FEBRUARY 2005

Meeting opened at 8:10 pm

Present: P. Carwardine, I. Endersby, P. Marriott, D. Stewart, K. Walker, G. Weeks.

Visitors: M. Endersby

Apologies: D. Dobrosak

Speaker:

John Wainer attended the centenary commemoration of the Horn Expedition to Central Australia in 1994 and 1995 and has made a number of subsequent trips to sample the invertebrates caught in vertebrate pit trap lines. The original expedition was funded by William Horn, a Member of Parliament in South Australia, and included the naturalists Baldwin Spencer and George Keartland. They collected about 400 invertebrates, a third of which were new to science. Their collection comprised mostly beetles, spiders, cockroaches, molluscs, grasshoppers, and aquatic insects but few ants, termites or flies.

The purpose of the re-enactment was to collect comprehensive samples in similar areas, to establish ecological roles of invertebrates, and to seek traditional landowner knowledge of species. Collecting was carried out using malaise, intercept, pit and light traps, by beating, fogging and netting. Large numbers of species and large numbers of individuals were collected; ants, beetles and spiders dominated the number of species, while ants comprised the largest numbers of individuals.

Before showing numerous pictures of the invertebrate life of central Australia John explained that the diversity of species is due to a mosaic of faunal assemblages which have evolved in response some characteristics of the arid zone which are unique to Australia. Rainfall is unpredictable but can occur in large events. The landscape is ancient, nutrient poor due to leaching and well-sorted by millions of years of wind and water. Plant structure and strategies have evolved to cope and fire is an important factor. Herbivores must contend with low nutrients although carbohydrates can be plentiful due to high sunlight. Physical sorting process have concentrated nutrients in some places but not others. Social insects, ants and termites, through cooperation, dominate as the major consumers.

Amongst the taxa illustrated by excellent photographs were scorpions, pseudoscorpions and centipedes, hemiptera, coleoptera (particularly weevils, scarabs, jewel beetles, tenebrionids, carabids and cerambycids), spectacular lacewings, grasshoppers, mantids, cockroaches and spiders.

The president thanked the speaker for an enjoyable and interesting presentation.

Minutes: Minutes of the 11 December General Meeting [*Vic. Ent.* 35(1): 1] were accepted subject to K. Cockfield being listed as a visitor and the spelling of B. Bainbridge being corrected (Carwardine/Stewart)

Treasurer's Report:

As the account books are with the Auditor there was no treasurer's report.

Editor's Report:

As the Editor had sent apologies there was no report but the President commended him on the high standard and content of the last two issues.

General Business

Membership applications have been received from Brian Bainbridge, Chris Timewell and James Tuttle. These will be presented for approval at the April meeting.

The April meeting will be the Annual General Meeting of the Society to receive reports and elect office bearers and an auditor

Exhibits:

Peter Carwardine showed live specimens of *Ocybadistes walkeri* (Yellow-banded Dart) and a larva of *Opodiphthera helema* (a saturnid moth closely related to the Emperor Gum Moth).

The meeting closed at 9:30 pm

MINUTES OF THE COUNCILLOR'S MEETING 18 MARCH 2005

Meeting opened at 5:10 pm

Present: P. Carwardine, D. Dobrosak, I. Endersby, P. Marriott.

Apologies: K. Walker.

Correspondence:

- Science Teachers Association of Victoria seeking a bursary from the Society for the Science Talent Search.
- Email from Kelvyn Dunn and attachment with a catalogue of butterfly species from Wings and Stings and Victorian Entomologist from 1971 to 1992.
- Letter from the Australian Museum announcing a Photographic competition (Up Close and Spineless). The closing date for the competition is Monday 27 June 2005. Photos must be submitted as a 20 x 25cm print and details can be found at http://amonline.net.au/up_close/registration.pdf

Treasurer's Report:

The Treasurer reported the account balances as: General account \$6361; Le Souëf account \$4,212. The Society's account books have been audited. The Treasurer prepared a breakdown of the costs of producing and mailing *Victorian Entomologist*. It was recommended that the subscription amounts remain the same for the next year.

Editor's Report:

There are sufficient articles in hand for the April issue but more are required for the June issue. Members that responded in the membership survey that they would be willing to provide articles are invited to contact the Editor. As the members address and interest list has not been published in the last two years, it will be included in the next *Vic. Ent.* Members should contact the Editor prior to 20 May 2005 should they not wish their address and interests printed in *Vic. Ent.*

General Business

- Council gratefully acknowledge Kelvyn Dunn's work in preparing the species list form *Wings and Stings* and *Vic. Ent.* This resource will be very useful to authors.
- Members are encouraged to come to the Annual General Meeting and accept nominations for Council positions. Please contact a Councillor if you are interested in being nominated.
- A list of the numbers and volume numbers of *Vic. Ent.* back issues stored at La Trobe University was prepared by Ian and Margaret Endersby. The work involved in collating this information was acknowledged by Council. The Editor is to prepare a similar list of back issues held by him.

Meeting closed 6:45 pm

A list of members names, addresses and interests is published in *Victorian Entomologist* every second year. The June 2005 issue of *Victorian Entomologist* will include the current list. Should any members not wish their names, addresses or interests to be published, or if their address or interests have changed, please let the editor know prior to 20 May 2005.

Mass oviposition by *Belenois java tentonia* (Lepidoptera: Pieridae) on *Correa baeuerlenii* (Rutaceae) in north east Victoria, with subsequent northward migration

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Abstract

Mass oviposition by *Belenois java tentonia* (Fabricius) (Lepidoptera: Pieridae) on a non-host plant, *Correa baeuerlenii* F.Muell. (Rutaceae), in Victoria in spring 1998 is reported. This 'egg dumping' appeared to occur during a movement hiatus after a migratory influx of the butterfly and before a low density northward migration.

Introduction

Larvae of the caper white, *Belenois java tentonia* (Fabricius) are known to feed in Australia on eight species of caper bush and wild orange, *Capparis* spp. and on warrior bush *Apophyllum anomalum* F.Muell. (all Capparaceae) (Braby 2000). They have also been reported to defoliate *Cassia* sp. (Caesalpinaceae) in the Northern Territory (Fisher 1978), a record ignored by Braby (2000). Neither *Capparis* spp. nor *A. anomalum* occur naturally in Victoria (Costermans 1983, Ross and Walsh 2003) although Hewson (1982) stated erroneously that *C. mitchelli* occurs in inland regions of all mainland Australian States, and mapped a Victorian distribution point, possibly based on cultivated material. *A. anomalum* occurs in a broad area of inland New South Wales and Queensland, northwards from the Murrumbidgee River, while *Capparis mitchelli*, one of the most widespread of the caper plants in Australia, occurs no further south than the Lachlan River (Costermans 1983). Of the known food plants, these two have the most southerly distributions in eastern Australia (Hewson 1982). However there are rare garden specimens of *Capparis* in Victoria, notably in the Royal Botanic Gardens, Melbourne, upon which eggs are laid, giving rise to small "temporary populations" (Dunn and Dunn 1991 p.52; see also French 1900 and McCubbin 1971).

Adult caper whites undertake migrations, often on an immense scale, through much of eastern Australia. These movements have not been adequately investigated and their function in the biology of the species remains obscure (McCubbin 1971, Fisher 1978, Common and Waterhouse 1981, Braby 2000). There appears to be no direct published evidence of the source of Victorian immigrants. McKeown (1945 p. 281) stated that restlessness and "flying hysteria" leading to migration usually occurs after the majority of females have laid their eggs, and that migrations may end up over the ocean, where many of the butterflies perish. The migrants often move in narrow "streams" (Smithers 1983 p. 48). During spring and early summer in the Blue Mountains, west of Sydney, the species migrates north, although strong winds can blow many of them from inland of the Great Dividing Range to eastern coastal areas (Smithers 1997). Dingle *et al.* (1999) concluded from an analysis of "the primary literature" (p. 324) that spring migrations are possibly predominantly to the south or west in New South Wales and Victoria, with no directional flight information available for other seasons (i.e. December to August). The migrations have been represented as movements from the continental interior, where some of the larval food plants are very widely distributed and common, to the coastal belt (McKeown 1945), however a number of known *Capparis* hosts have mainly coastal distributions while others occur both inland and along the coast (Hewson 1982).

Observations

Caper whites were observed in large numbers in the last two weeks of October 1998 in a garden at Glenmaree Drive, Killawarra (36°17'S 146°15.5'E), north-east Victoria, c. 10 km north-west of Wangaratta, with "hundreds" at one time on the flowers of a patch of red valerian, *Centrauthus ruber* (L.) DC. (Valerianaceae) (A.R. and W.J. Faithfull personal observations). On 31 October they were common in the garden, with no migratory movement apparent. A single mating pair was seen. On 1 November migratory movement was again not apparent but many individuals were flying around the garden and feeding at flowers of various cultivated plants, including species of *Callistemon* and *Grevillea*. Numerous females were observed ovipositing on a large shrub of chef's hat, *Correa baeuerlenii* F.Muell. (Rutaceae), a native of the southern coast and tablelands of New South Wales from the Clyde River district to Bega (Porteners and Weston 1991). Oviposition on orange, lemon and grapefruit trees (*Citrus sinensis* (L.) Osbeck, *C. limon* (L.) Burm.f., *C. x paradisi* Macfad., Rutaceae) and other plants in the same garden was not observed.

Large numbers of eggs were present on leaf laminae and petioles all over the plant, with higher densities on the more elevated leaves and on younger leaves. It seemed that oviposition had been occurring for some days. The bush itself had approximately 80 upright stems of 60 cm length and 5 mm width each bearing numerous small side branches. One of these stems bore approximately 500 leaves and a single leaf sampled from near the top of a stem yielded 42 first instar larvae. The total number of eggs present was possibly in excess of 100,000. The eggs were fertile but no larvae of material collected survived past the first instar, and no feeding was observed. Larvae which emerged evidently died: an examination of the plant on 2 January 1999 found no foliage damage that could be attributed to *B. java* and no evidence of pupal cases.

During the late morning and early afternoon of the following day, 2 November, a few flying individuals of *B. java* were seen, mostly from a moving car, between Wangaratta (36°21' 146°19') and Benalla (36°33' 145°59'), with no clear directional movement apparent. But in a discontinuous series of observations totalling 20 minutes between 3.45 and 4.24 pm ESST, in a north-south trending powerline easement, cleared of trees, on the edge of Reef Hills Park, ca. 4 km south west of Benalla, 9 individuals were observed crossing a 16 m long east-west line, 8 flying north (0.013 individuals per m per minute) and 1 flying south, indicating a low density northward migration. A much denser southward migratory movement of *Vanessa kershawi* (McCoy) (Lepidoptera: Nymphalidae) was happening simultaneously.

Reports of very large numbers of *B. java* in the Port Phillip region of Victoria were made at a meeting of the Peninsula Field Naturalists Club on 11 November. Flights were said to have arrived at Frankston (38°10' 145°08') from the west on 30 October, coming with the wind across Port Phillip Bay. Florence Hoskings reported that they arrived from the direction of Geelong (due west) on 30 or 31 October, in a front at least from Frankston Pier to Olivers Hill (ca. 1.3 km south-west of the Pier), and that great numbers clustered on trees of coast banksia, *Banksia marginata* Cav., and other foreshore plants. At the same meeting it was reported that many dead individuals were seen on the Bogong High Plains (ca. 36°54' 147°16') on 31 October, "killed by" snow. Predominantly westerly movement of *B. java* in low numbers was observed near Bridgewater (36°36' 143°57') and at Kerang (35°44' 143° 55') on 19 November and near Canary Island (35°59' 143°51') on 20 November (personal observations).

Natural populations of common correa, *Correa reflexa* (Labill.) Vent. and cultivated specimens of coast correa, *C. alba* Andrews, and a correa cultivar, possibly *C. pulchella*, were examined at Frankston on 5 and 9 November but no eggs or evidence of oviposition were found (personal observations).

The garden at Killawarra is visited by *B. java* every spring but no oviposition on the *Correa* or any other plant has subsequently been observed.

Discussion

The phenomenon of 'egg dumping' by *B. java* has been observed previously by E.D. Edwards, with migrant females depositing massive numbers of eggs on cultivated orange and on *Zieria* (Rutaceae) in the Murrumbidgee irrigation area of southern New South Wales (Common and Waterhouse 1981) near Yanco (Braby 2000). Larvae from the eggs that hatched died soon after sampling (Common and Waterhouse 1981). Cole (1922) also reported oviposition on orange, on the young tips, in the Wangaratta area, and noted that all the young larvae died within 10 days. Oviposition on *Banksia serrata* (L.) (Proteaceae) has also been observed, with total mortality of the larvae without feeding (Common and Waterhouse 1981 p.50), however whether this was an example of mass oviposition does not appear to be recorded in published literature.

When ovipositing on suitable larval food plants, *B. java* females often inundate isolated specimens with eggs and oviposit in clusters that may consist of over 100 eggs (Braby 2000). Raff (1925) recorded counts of 150 and 125 eggs on single leaves of *Capparis* sp. in Melbourne. Williams (1965) and Nicholson (1927) refer to an estimate that 250,000 eggs were laid on a 4.6 m high caper tree in G.A. Waterhouse's Sydney garden during a mass migration. Fisher (1978) estimated that 40,000 eggs were deposited on a specimen of *C. mitchelli* at the Waite Agricultural Research Station during a migration in November 1975. This behaviour appears to be maintained when adult females are deluded into egg-dumping on non-host plants.

The known instances of massive egg dumping by *B. java* on plants that are not suitable larval food have occurred in areas where its host plants are naturally absent. Egg dumping is probably a common occurrence in female insects deprived of suitable hosts. *Netelia* spp. (Hymenoptera: Ichneumonidae), for example, "throw off fully developed eggs for which no host has been found" probably in part to avoid the consequences of them hatching within the mother (Cushman 1926 p. 39). Butterflies frequently oviposit on plants which are unsuitable for larval development (Common and Waterhouse 1981) and at least one other Australian species is known to mistakenly inundate non-host plants with eggs (Kitching and Zalucki 1983).

B. java presumably chooses plants that provide a combination of chemical and other oviposition cues similar to the preferred host plants, and which might therefore be expected to be taxonomically related to those hosts. The essential oils of plants are commonly important attractants to female butterflies (Common and Waterhouse 1981). Plants in the Capparaceae produce mustard oil glycosides, which are presumably retained in adult butterflies and provide a chemical defence against predation (Sims 1974). Mustard oils are also produced by plants of the Brassicaceae and Resedaceae (Sims 1974, Low 1993). However, except for *B. serrata*, the plants on which egg dumping by *B. java* has been recorded belong to the Rutaceae, which is not considered to be closely related to Capparaceae (Hutchinson 1964 1967, Cronquist 1981, Kanis 1981) and the two families in general appear to have little chemical similarity in regard to essential oils (Cronquist 1981). The leaves of Rutaceae contain numerous oil glands and many members of the family have strong and characteristic aromas. *Zieria* spp. have been described as pleasantly and unpleasantly odoriferous (Duretto 1999) although a strong odour when handled is not characteristic of the whole genus (Costermans 1983). *Z. veronica* (F. Mueller) Benthham has strongly and pleasantly lemon-scented foliage (Galbraith 1962, Willis 1972, Costermans 1983) and *Z. arborescens* Sims (stinkwood) has an offensive odour when handled (Costermans 1983). *Citrus* spp. contain methyl cavicol, anethole and anisyl aldehyde (Common and Waterhouse 1981) while the flower scent of a number of *Citrus* spp. has been classified as "heavy" (intense, heady, overpowering sweetness) and of the nerole type (Willis 1944). The lemon scent of plant foliage is

due to the aldehydes citral and citronellal (Willis 1944). The foliage of one species of *Correa*, *C. schlehtendalii* H.Behr, is strongly aromatic (Costermans 1983) with an odour like ripe apricots (Densley 1993), while that of *C. alba* Andrews is aromatic when crushed (Corrick and Fuhrer 2000). The scent of crushed *C. baeuerlenii* foliage is weak and I am not able to characterise it.

The chemical dissimilarity of Capparaceae and Rutaceae suggests that visual and tactile stimuli might therefore be more important oviposition stimuli for *B. java*. On the other hand, the familial relatedness of the three non-host species on which mass egg dumping has been recorded suggests that a chemical stimulus may nevertheless be important. Evidently egg dumping is not just a simple case of the butterfly mistaking a non-host plant for a host, since the *Correa* on which eggs were dumped was ignored in subsequent years.

The initial spring migration of *B. java* into the Wangaratta district of north-east Victoria is generally from the north or north east (personal observations). Disney (1979) reported *B. java* migrating south-west along a front over 300 km long from 11 km north of Wangaratta to near Yass, New South Wales, on 12 November 1977. Bungay (1974) reported a north to south migration passing through Wagga, NSW (170 km NNW of Wangaratta), from 18 to 22 November 1973. Galbraith (1974) reported very large numbers of non-migrating *B. java* in the Warby Ranges (just west of Wangaratta) and at Powers Lookout in north-east Victoria in October 1973. Cole (1922 p.85) recorded that caper whites "visited the Wangaratta district in myriads" in November and December 1922. Large numbers of larvae, pupae and adults associated with the larval food plant *A. anomalum* were present in southern inland New South Wales from Hay to Balranald on 18 November 1973 (Sims 1974). Migrant *B. java* pass through the Wangaratta district in some years and stop there in others, and these flights may originate in inland or coastal New South Wales.

The non-migratory movement, adult feeding activity and egg-laying of *B. java* at Killawarra on 31 October and 1 November suggests a period of relative quietude at the end of a southward migratory episode. At least some mating occurred during this non-migratory period. Observations of lack of clear directional movement between Wangaratta and Benalla on 2 November and then of northerly movement at Reef Hills Park later that day, may indicate the genesis of a return migration, a phenomenon which McCubbin (1971) suggested had not been documented, but may have been observed by Chapman (1908) in southern Victoria and by Best (1920 p.87) "along the Omeo road" in the Victorian alps, probably near Mount St Bernard. However the other observations of population movement elsewhere in Victoria in October and November 1998, reported above, would appear to belie this simple interpretation.

Migration to a population sink, without return migration should result in selection against migration: theoretical considerations therefore suggest that return migration, in some form, must generally occur. Dingle *et al.* (1999 p.327) remarked that return migrations may not generally be observed because they involve smaller numbers, or may possibly be in similar numbers but still not conspicuous, or return movement to the original source breeding area may occur by diffuse movement after breeding. *B. java* might suffer substantial population losses in Victoria during and after its southern migrations (as happens in the Brisbane area: Woodall ?1995), but on occasion smaller numbers appear to return northwards after a movement hiatus in which local flight and nectar-feeding, and some mating and oviposition may occur. On return to suitable breeding areas, host plants might again be heavily attacked, providing an initial impetus (resource depletion) for migratory dispersal of a new generation of adults.

Acknowledgements

I thank W.J. and A.R.Faithfull, and F.Hoskings and other members of the Peninsula Field Naturalists Club, for communicating their observations.

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Stung by a Large *Polistes* Wasp - A Nasty Experience in Samoa, Polynesia (Hymenoptera: Vespidae) Followed by a Noisome Comorbid Spider Bite in Australia

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Abstract

The 'lived-experience' of a wasp sting in Samoa, arguably by the vespid, *Polistes olivaceus* (DeGeer) is described. It is a phenomenological anecdotal account based on a self-reported single, convenience observation, described in popular literary style for the leisure reading (largely because of identification limitations) of our common-interest community. The painful polistine sting symptomatology is compared and contrasted with a sequential comorbid spider bite (presumably that of a white-tailed spider, *Lampona cylindrata*) received soon after in Victoria, Australia. The polistine wasp's toxin exceeded the spider venom in perceived pain. However, the wasp sting paled in terms of longitudinal dermal insult significance when compared with the necrosis that resulted either from the spider's toxin, a possible fang-introduced infection, or an inappropriate immune response.

Introduction - stings and creeping things!

Like most field entomologists, I have had the odd, nasty experience with stinging and biting critters during my travels in the Asia-Pacific region. In temperate Australia I remember a wrist-brush with those colorful, slug-like cup-moth caterpillars (Limacodidae), grouped in triads on low hanging eucalypt leaves. They inflicted a nettle-like sting and rash. I have had repeated exposure to the irritating hairs of caterpillars of *Euproctis edwardsi* (Lymantriidae) accumulated under Eucalypt bark. The airborne hairs, exposed upon lifting bark, are a curse to seekers of larvae and pupae of *Ogyris* (Lycaenidae) in mistletoe-infested woodlands of southern Australia. When combined with contaminated clothing this makes for unpleasant, itchy caterpillar dermatitis - enough to spoil any field trip. Readers of Australian entomological publications may recall Dr Trevor Hawkeswood's (1991) eye-watering account of an unpleasant spider bite, received whilst hunting beetles in coastal New South Wales, Australia. It is common to receive miscellaneous ant bites whilst seeking myrmecophilous Lepidopteran caterpillars, but these are usually non-events. However, being savaged by numerous *Occophylla* ants whilst hunting juveniles of *Brassolis* (Lycaenidae) in northern Queensland was of my own undoing (see Dunn 1994) - latex examination gloves, which enable handling dexterity, can be prophylactic. Most readers will have experienced the occasional bee sting, and in northern Australia probably many insect collectors eventually fall victim to those small, yet fearsome vespids (*Rhopalidia* spp.) that lurk in the paperbark swamps and mangroves. Other Queensland paper wasps (eg. *Polistes* spp.) perch and rotate like miniature jet fighters on their pedunculate, cellular nests, then unexpectedly charge out in a small cohort to attack the unsuspecting, net-waving entomologist!

In this contemporaneously written story, I tell of an unpleasant encounter with a medium sized *Polistes* wasp, whilst butterfly watching in O Le Pupu-Pu'e National Park in Upolu Island, Samoa.

Monday, 17 February 2003: southern coast of Upolu Island - butterfly watching

It was the wet season in the South Pacific, yet very few butterflies were active despite optimal, late morning, sunny conditions at the Togitogiga waterfall. This multipurpose attraction, about 3km NNW of Saleilua in the Togitogiga Scenic Reserve, is nestled amidst dense *Merrrenia* (Convolvulaceae) vine-infested rainforest, and is a popular swimming spot with the Samoans. My purpose, however, was focussed on insect life video-photography, predominantly butterflies. Males of the common Pacific Varied eggfly, *Hypolimnas bolina* and an occasional Argus, *Junonia*

villida basked and patrolled open herb-areas along the river. Among denser vegetation many danaine adults of *Euploea algea schmeltzi* and *Tirumala lianata* hungrily foraged at flowers of *Morinda citrifolia* (Rubiaceae) (1145h WST - Western Samoa Time). This is a common medicinal tree, with conspicuous fruits, that grows in dense secondary forest and agroforests - indeed, a favourite nectar source for many Pacific and Asian butterflies in my experience - and used to make therapeutic 'noni' juice by the Polynesians. Anticipating a greater diversity elsewhere, I hiked south-west several kilometres through the drier woodlands, to explore the coastal trail that meanders through littoral pandanus scrubs and vine-forests clothing the southern cliffs at Cape Niuafo'i.

The early afternoon, tropical summer sunshine intensely heated the woodlands. The sandy 4WD track leading south to the lava coast was a monotonous and exhausting walk at this hour - reminiscent of Rudyard Kipling's familiar adage: 'Only mad dogs and Englishmen [or should that read entomologists?] go out in the midday sun' (Kipling 1910, source untraced). Along the margins of secondary forest, many adults of *Tirumala lianata* fed continuously at the ubiquitous snakeweed flowers (*Stachytarpheta* sp.: Verbenaceae). And, a few localised *Vagrans egista* were active, breaking the general butterfly paucity. *Vagrans* adults were smaller throughout Upolu compared with those seen in Tonga, Rarotonga and other Pacific islands in summer. All were males - the distinctive tomal shape of the hindwing, seen clearly at close range as they flower-fed at head-height, clarified their identification.

The littoral vineforest, into which the lonely walking trail vanished, shimmered ahead like a mirage. Sweat-soaked I felt refreshing coolness upon entering its shadows. A solitary gliding male of *Euploea algea schmeltzi*, with his yellowish, abdominal hair pencils fully extended, patrolled a lek, a metre or so above the damp leaf-littered forest floor. As it followed its multi-repeated flight path through sections of very dark shade, it would seem to vanish briefly in the filtered light, aided by its sombre coloring. Some brilliant blue polyommata lycaenids (probably *Jamides boclus* group) patrolled and perched in localised patches in sunny glades at eye height, but I felt too exhausted to take any video photography. Instead, seating myself at the base of a tree to rest, I watched the crow continue his patrol, pausing very occasionally to settle with closed wings on deeply shaded hanging leaves before resuming again.

An unexpected encounter

At about 1400h (WST), I wandered adjacent dense, cliff-top pandanus forest along the O Le Pupu lava coast. A solitary lycaenid, most probably *Famegana alsulus*, flew amongst herbs near my feet, and then whilst peering amongst the flickering shadows for indicative movement of other more photogenic butterflies, I felt something rip into the inner side of the triceps of my right arm. The intense, sharp and burning pain caused me to release my daypack and quickly examine my arm for a suspected open-wound injury. None was evident, so a sting seemed probable, but no insect or spider was near the pain site. Explanation quells fear, but nothing shook from my shirt. Annoyed, I scanned the ground hoping to see a scuttling culprit as I redressed. Having travelled several months earlier in the rainforests of northern Cambodia where deadly, pale-green Hanuman snakes hunt immediately after summer rains, I was used to being ever alert for dangling horrors. Hence, momentarily forgetting my biogeography, I feared a tree-snake bite! Relieved, I saw I was a metre from any foliage, and then recalled their absence from Polynesia.

A single, fine trace-blood track running in a needle-like path and extending about 3mm in length was at the pain site. It descended from the surface under the dermal layer at an acute angle, just at or below the biceps and above the triceps muscles. Pressure to this site caused a small blood spot (pin-head quantity) to ball on the skin at the puncture, indicating a tiny wound to subcutaneous

tissue or deeper, with capillary contact. The single puncture ruled out a spider - relieving further anxiety. My next suspicion was a hymenopteran.

Within moments of the sting, my right biceps experienced muscle tremors and involuntary minor ripple-contractions lasting a few seconds - a reaction I watched with surprise and curiosity, as this was a new physiological experience. These twitches or fasciculations subsided to continuous burning pain of a very conscious severity (about 5/10 on a pain scale - 10 being unbearable) - unproductive pain, particularly of unclear cause promotes anxiety increasing its effect! The intense burning feeling suggested an alkaloid poison, or a nerve-damaging agent. The resultant muscle tremors support the latter, and suggest the action of a nerve depolariser. 'Fasciculation' is a medical term that refers to "localised, uncoordinated, uncontrollable twitching of a single muscle group innervated by a single motor nerve fibre or filament that may be palpated and seen under the skin" (Anderson 2002: 659). According to this source, "Dietary deficiency, cerebral palsy, fever, neuralgia, polio, rheumatic heart disease, sodium deficiency, tic, or uremia", are among common causatives (p.659). Localised insect envenomation is not listed, but I recalled reading once in a popular source that Sydney funnel-web spider (*Atrax robusta*) bites can apparently stimulate muscle tremors at the wound site - a thought far from reassuring at that time! I reasoned that the supposed insect culprit, although not seen, must have got trapped under my armpit, after having crawled or flown in from beneath my daypack. I hoped it was nothing too poisonous, as I was in a remote location where transport was irregular. A serious anaphylactic hymenopteran reaction, although a rare potentiality, was far from desirable!

I carried an anti-inflammatory cream, Stingose® in my daypack, yet neglected to use it! No idea how I could forget an important self-help thing like that. Guess I was a little startled, or preoccupied by my diagnosis as I hastily flipped through my Lonely Planet guidebook for some hints. For the adventurous sole traveller I've found this handy series knows everything about anything one would want to know in a hurry - that is, when far from an Internet cafe. I was reassured to read in the South Pacific edition, that there are no dangerous animals in the forests of Samoa - bee and wasp stings are described as "painful rather than dangerous" (Hunt *et al.* 2000: 88).

Solitary, medium sized (about 3cm in length) orange-yellow, stout-bodied, hornet-like wasps were prolific in the woodland and occasionally seen flying beneath the pandanus forest canopy inspecting leaves and low vegetation. I had also seen them regularly flying along the vine-forest margins, but they kept to themselves, probably hunting caterpillars or larvae of other insects, so I didn't give them a second thought - apart from noting their local ubiquity - being the most conspicuous aerial insect. Then about three minutes after my sting, one suddenly charged at me! I bolted from the area - evidently some were aggressive! Perhaps it was even the same maleficent individual that had punctured my flesh? I no longer doubted which particular insect was the culprit!

The toxin remained localised and a small dispersing halo of inflammation soon appeared (diameter of about 15mm) at the penetration site from bodily release of histamine. Burning pain, characteristic of nerve injury continued for at least an hour. It gradually settled to about 4/10 - a 'grin and bear it' severity, tolerated in the typical Northern European 'stiff upper lip' response prized in western culture (Allis 1992). I am somewhat stoical in physical terms particularly when distracted by entomological and recreational pursuits, but have no claim to Nepalese origin - a people group known for their tolerance of higher pain intensity than most (Clark & Clark 1980). Thus, I was none too happy on facing a tiring afternoon return trek to the Main Coast Road with an aching arm and few entomological distractions.

Intermittent light showers were now passing above - it seemed my butterfly observations were over for the day - a common mid afternoon occurrence during the wet season. Moreover, at this time of day in the South Pacific tropics butterfly life often lulls anyway, even in optimal weather. As the sky to the north in the vicinity of Mt Fito (a volcanic landform rising 1158m) blackened pending a very fierce electrical storm, I now hurriedly commenced on my four-kilometre hike out through, increasingly slosly and muddy woodland. Visitors to the remote O Le Pupu-Pu'e National Park - a Polynesian name which means "from the coast to the mountain top" - are advised to bring their "own food and water" (Hunt et al. 2000: 371), albeit on my visit the latter was now plentiful! Unexpectedly drenched a second time now in Upolu, and wary of worsening lightening forks striking the ranges, I was glad to arrive at a palm-thatched bus shelter on the park boundary near Sa'agafou - the only shelter available for miles! Indeed, it had become a miserable afternoon! Then half-naked, ringing-out my soaked jeans and shirt, I almost missed the infrequent village bus for my return trip to Apia. The bus shelter was off road some 10m amidst secondary scrub and seemed otherwise invisible in the continuous sheet rain. According to a local taro-farmer, the breezy island-circuit school buses don't normally stop unless hailed, compelling me to stand near the middle of the road to ensure a lift.

Over the next few hours the pain gradually subsided, but two days later a rosy rash, like severe sunburn - involving an area roughly the size of my whole hand (about 10 x 20 square centimetres) covered my inner biceps and triceps. It had also spread down my arm from the sting site just below the armpit to my elbow. The former blood-lined puncture site appeared as a small inconspicuous, non-raised red spot. The rash, a delayed hypersensitivity, histamine reaction was now very hot to touch! Redness and heat are normal responses to inflammatory mediators that create peripheral vasodilation - therein promoting increased blood flow to this entomologically insulted area. The absence of prominent swelling or oedema, possibilities from inflammatory exudate, suggested absence of infection - at least my tetanus shots were up to date! When back in Fiji and hoping someone might recognise the rash and confirm a common wasp sting, I showed it to the Melanesian hotel workers, one of whom touched it saying, "sunburn!" She was shocked when I shook my head saying 'sting', exclaiming, "You must see doctor!" Under masculinity alignment, some social de-constructionists might argue for a male under-use of medical services for preventative health problems, rather than female excess (Doyal 2000, Parslow et al. 2004). Whether this be true or otherwise, since the injury produced no headache, fever or similar systemic concerns I was not too worried - it was obviously not serious, and remained fairly localised and uninfected.

My extensive rash from the Samoan wasp was perhaps an atypical allergic reaction, and probably an immunologic response from antibodies to vespid attacks a year previous, if all species possess similar antigens (ie. perhaps a re-exposure very minor anaphylaxis reaction?). I had been repeatedly stung by paper wasps (Vespidae) in northern Queensland in early January 2002. On that unfortunate occasion, as I intently watched for settling skippers in the brightly sunlit background, I had absent mindedly wandered too close to a partly silhouetted, 30cm long wasp-laden, paper-covered nest hanging at head height from a tree branch in paperbark swamplands at Forrest Beach in the wet tropics. The large and bulky nest seemed similar to that described by Reik (1970: 936) for *Ropalidia*, which "blends well with their surroundings", unlike the conspicuous, tessellated comb-nests of *Polistes variabilis*, and *P. humilis* which I have commonly seen in residential areas in coastal Queensland. The paper wasps' stings were momentarily sharp, like burning needles, and a few expletives were accidentally let fly on account of the shock impact as I received multiple facial stings! These Queensland vespids' stings lasted only for about 5-10 minutes before settling to a dull heat sensation and no obvious rash developed. Although stung simultaneously by many wasps, the impact was nowhere near as lingeringly painful as the Samoan wasp.

Wasps can be attracted to 'sweaty people' (or probably their perfumed deodorants) I've heard it said amongst Queensland folklore. 'Sweaty' I sure was, on that wet-season afternoon in Polynesia - although probably only about 30°C, it was oppressively humid under the forest canopy, and more so on the brink of a storm. Armpits are sites of deodorants and where the wasp may have been heading, prior to presumed compression against my arm. The charging orange wasp, from which I fled, and my wound received only minutes before remain circumstantially linked.

Dr James Carpenter, a wasp specialist at the American Museum of Natural History, kindly commented that "there are only three Vespidae recorded from Samoa." The two eumenines are *Anterhynchium rufipes* (Fabricius) and *Parodynerus bicinctus* (Fabricius), and "neither of these is predominantly orange, but the *Polistes* is." Moreover, the "eumenines are unlikely to sting anyway, but polistines are another matter...[so]...it seems more likely from your description that it was a *Polistes*, namely *olivaceus* (DeGeer), which is widespread in the Pacific, including Samoa." He further clarified, "the wasp that stung you in Queensland was certainly *Ropalidia romandi* (Le Guillou), which is the aggressive species with which Queenslanders are all too familiar. There are only two species of Australian paper wasps that cover their nests with an envelope, and *romandi* is the common one - the other (*R. nigrior*) is found only in the Iron Range, but *romandi* is abundant across northern Queensland into NT. It is a small, yellow species, and the smaller size may explain why the symptoms were not as severe as with the *Polistes*. But note that sting severity is also a function of the amount of venom injected - you may have had some bad luck in Samoa!" (Carpenter pers. comm. 2004). Those interested in Polynesian wasp biogeography might consult specialist literature by Carpenter (1996), Giordani Soika (1957) and Perkins & Cheesman (1928).

A comorbid spider bite

The very painful sting from *Polistes olivaceus* was minor in symptomatic duration compared to a likely white-tailed spider bite, received a few weeks later in the foothills east of Melbourne. Awoken by crawling movements on my neck, but not a fang insult, a black scuttling spider vanished across my pillow before I could confirm any characters - rather unfortunately in terms of identification rigour for this claim on sequential, arthropod-induced comorbidity. Nonetheless, it was likely to be a white-tailed spider (*Lampona cylindrata*) as there was a 'big mother' in my bed a day or so before - which I had promptly killed. At first I thought I had dreamt this new one, as there was no stinging sensation suggesting a bite, and so I quickly returned to sleep.

This roaming arachnid predator, convicted on the balance of probabilities, can be common at times indoors in late summer and early autumn in this part of open-forested Victoria where I live. However on rare occasions, other potentially serious biting culprits sometimes lurk indoors. These have included a large black spider with prominent finger-like posterior spinnerets (perhaps a trapdoor or funnel web), small blackish wolf spiders (Lycosidae), and common black house spiders (*Badumna* sp.). All have usually been splattered before I had an opportunity to examine or collect them intact!

My spider bite was seemingly painless, but within the first two hours I re-awoke with a full body sweat and bad headache. A red circular flattened swelling of 10mm diameter appeared on my neck within a day or so. There was trace evidence of a twin puncture, with width separation of about 2 or 3mm suggesting a mygalomorph spider bite. Yet several times over the last decade I have had similar looking bites and all of mild pain sensitivity; these slowly disappeared after a week or so, and none was associated with sweating and headache. Several days later this more serious bite erupted into masses of very itchy, tiny orange bubble-blisters that horribly ulcerated, and then full skin-thickness eroded into three small deep-crater necroses.

After a week or more these ulcerated craters blackened into disgusting, dark-thread-linked eschars scattered over a three-centimetre diameter, ovoid-shaped region of my neck situated just behind my right ear lobe. The slowly enlarging ulcerations remained resistant to a broad-spectrum, penicillin-based antibiotic prescribed soon after for a supposed wound-infective bacterium obtained overseas. With the eventual shedding of the eschars, I thought the worst was over. Then a centimetre away, new emergent satellite, pinhead-sized, blistering clusters erupted, and evolved similarly! Collectively the multi-ulcerated noisome sore took three months to heal and left pale shiny scarring at the site - a depressing case of necrotic arachnidism. My sister remarked as she examined an Internet site on the topic soon after the first ulceration appeared, "better see a doctor quickly I think - there wont be much left of you if they have to amputate at the neck!" I certainly heeded that advice!

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THE ENTOMOLOGICAL SOCIETY OF VICTORIA INC.
STATEMENT OF RECEIPTS AND PAYMENTS
FOR THE YEAR ENDED 31 DECEMBER 2004

GENERAL ACCOUNT

INCOME Subscriptions

| | | | |
|---------------------|------|------------|----------|
| Member 2004 | | 1557 | |
| | 2005 | <u>308</u> | 1865 |
| Institution | 2004 | 197 | |
| | 2005 | <u>93</u> | 290 |
| Donations | | | 24 |
| Brochure Mailout | | | 80 |
| Sale of Back Issues | | | <u>5</u> |
| | | | 2264 |

EXPENDITURE

Journal Costs

| | | | |
|------------------------|----------|------|------|
| Printing | 1718 | | |
| Postage | 494 | | |
| Envelopes | 60 | | |
| Other | <u>8</u> | 2280 | |
| Lecture Room Hire | | 0 | |
| Corporate Affairs Fees | | 35 | |
| Aust Ent Soc Sub. | | 105 | |
| Government Taxes | | 12 | |
| Postage | | 83 | |
| Donation | | 20 | 2535 |

SURPLUS/(DEFICIT) FOR YEAR

| | | | |
|---------------------------------------|--|--|--------------------|
| | | | (271) |
| Add Balance brought forward from 2002 | | | 2272 |
| Return of Editor's Advance | | | <u>300</u> |
| Balance carried-forward to 2004 | | | <u><u>2301</u></u> |

LE SOUËF MEMORIAL FUND

INTEREST INCOME

| | | |
|---------------------------------------|-----------|--------------------|
| Treasury Corp. Victoria | 126 | |
| Commonwealth Bank Fixed Deposit | 146 | |
| Commonwealth Bank Savings Account | <u>13</u> | 285 |
| Less | | |
| Award Expenditure | 0 | |
| Science Talent Search | <u>60</u> | 60 |
| SURPLUS/(DEFICIT) FOR YEAR | | 225 |
| Add balance brought forward from 2002 | | <u>1587</u> |
| Balance carried forward to 2004 | | <u><u>1812</u></u> |

STATEMENT OF ASSETS AT 31 DECEMBER 2004

GENERAL ACCOUNT

| | |
|---------------|--------------------|
| Bank Account | 2301 |
| Term Deposit | 4000 |
| Stock of Maps | <u>40</u> |
| | <u><u>6341</u></u> |

LE SOUËF MEMORIAL FUND

| | |
|----------------------------------|--------------------|
| Bank Account | 1812 |
| Fixed Deposit Stock | |
| Treasury Corporation of Victoria | 1400 |
| Commonwealth Bank Fixed Deposit | <u>1000</u> |
| | <u><u>2400</u></u> |
| | <u><u>4212</u></u> |

Auditors Report:

I report that I have audited the year 2004 accounts of the Entomological Society of Victoria, comprising the Statement of Receipts and Expenditure - General Account, the Statement of Receipts and Expenditure for the Le Souef Memorial Fund and the Statement of Assets as at 31 December 2004..

The audit procedure examined the account books and records of the Society, including bank statements, bank books and cheque books.

In my opinion the accounts are properly drawn up and accurately record the financial transactions of the Society. Further, the financial records of the Society are in accordance with applicable accounting standards.

S.J. Cowling
9 March 2005

Society Field Trips

The Council has recognised two issues associated with field collecting trips.

- While it does not want to infringe on the individual rights of members it cannot condone behaviour which would affect the Society's reputation;
- also, it has an obligation to inform members of potential hazards that may be encountered while on field excursions

As a first step Council prepared an excursion guide which addressed the ethics of collecting and also safety procedures. Firstly this showed that our Collecting Policy, agreed some year's ago, is probably not known to many members and should be reviewed and published.

Safety aspects have become more onerous with changes in legislation and community expectations. The obligations of an excursion leader have become quite exacting with the need to survey the site to identify any potential hazards and means for mitigating them. There is a need for participants to be given a comprehensive briefing before the excursion departs, regular rendezvous points and times established, and some access restrictions might have to be applied for areas of high potential hazard.

The Society would need to carry a \$10 million public liability insurance cover which would cost about \$700 per year.

Summarising Council's long discussion on this subject:

- it is unreasonable to expect all members to contribute \$7 of their annual subscription to fund a public liability insurance premium for those few who attend excursions
- it is infeasible to charge those members who attend excursions \$50-\$100 to cover insurance
- asking members to sign some waiver document in lieu of the insurance payment is probably not sufficient protection for the Society
- being an incorporated society would not relieve the obligation to carry insurance
- implementing the necessary safety inspections and procedures would place a large burden on the excursion leader
- IT IS WITH REGRET that the Council finds itself in a position where it can no longer take the risk of running field excursions even though they provide valuable information about the State's invertebrate fauna.

Council would appreciate constructive comments on field trips and any legal and feasible ways in which they can be resumed.

Australian Journal of Entomology Volume 44, Part 1, 2005

The Australian Entomological Society publishes the *Australian Journal of Entomology* quarterly. The Entomological Society of Victoria is an affiliated society and will, in future, publish the contents of the Journal for the wider interest of its members.

WA Palmer: Corrections to Morris and Mound (2004) 'Molecular relationships between populations of South African citrus thrips (*Scirtothrips aurantii* Faure) in South Africa and Queensland, Australia'

SYSTEMATICS

Michael G Elliott: First record of the genus *Brachygaster* Leach (Hymenoptera: Evaniidae) from Australia with the description of a new species

Gugs Lushai, Myron P Zalucki, David A S Smith, Dave Goulson & Greg Daniels: The lesser wanderer butterfly, *Danaus petilia* (Stoll 1790) stat. rev. (Lepidoptera: Danainae), reinstated as a species

Jian-xiu Chen, Zhangjun Leng & Penelope Greenslade: Australian species of *Sinella* (*Sinella*) Brook (Collembola: Entomobryidae)

MORPHOLOGY

J Mark Rowland, Clifford R Qualls & Laurence Beaudoin-Ollivier: Discrimination of alternative male phenotypes in *Scapanes australis* (Boisduval) (Coleoptera: Scarabaeidae: Dynastinae)

POPULATION GENETICS

Liza J Miller & Peter G Allsopp: Phylogeography of the scarab beetle *Antitrogus parvulus* Britton (Coleoptera: Scarabaeidae) in south-eastern Queensland, Australia

EXOTIC INCURSIONS

Michael T Henshaw, Nicole Kunzmann, Cas Vanderwoude, Matthias Sanetra & Ross H Crozier: Population genetics and history of the introduced fire ant, *Solenopsis invicta* Buren (Hymenoptera: Formicidae), in Australia

ECOLOGY

Renkang Peng, Keith Christian & Karen Gibb: Ecology of the fruit spotting bug, *Amblypelta lutescens lutescens* Distant (Hemiptera: Coreidae) in cashew plantations, with particular reference to the potential for its biological control

Mohammad Golam N Azam, David E Walter, Geoff K Waite & John R Hargreaves: Rainforest habitat resistance to the migration of *Phytosciulus persimilis* Athias-Henriot (Acari: Phytoseiidae) in south-eastern Queensland

Thomas P Freeman, John A Goolsby, Sebahat K Ozman & Dennis R Nelson: An ultrastructural study of the relationship between the mite *Floracarus perrepa* Knihinicki & Boczek (Acariformes: Eriophyidae) and the fern *Lygodium microphyllum* (Lygodiaceae)

PEST MANAGEMENT

David A H Murray, Richard J Lloyd & Jamie E Hopkinson: Efficacy of new insecticides for management of *Helicoverpa* spp. (Lepidoptera: Noctuidae) in Australian grain crops

Glenn Bellis, David Hollis & Sarah Jacobson: Asian citrus psyllid, *Diaphorina citri* Kuwayama (Hemiptera: Psyllidae), and huanglongbing disease do not exist in the Stapleton Station area of the Northern Territory of Australia

Stephen Goodwin: Chemical control of fig longicorn, *Acalolepta vastator* (Newman) (Coleoptera: Cerambycidae), infesting grapevines

WEED BIOCONTROL

Kylie E Galway & Matthew F Purcell: Laboratory life history and field observations of *Poliopaschia lithochlora* (Lower) (Lepidoptera: Pyralidae), a potential biological control agent for *Melaleuca quinquenervia* (Myrtaceae)

K Dhileepan, Catherine J Lockett & Rachel E McFadyen: Larval parasitism by native insects on the introduced stem-galling moth *Epiblema strenuana* Walker (Lepidoptera: Tortricidae) and its implications for biological control of *Parthenium hysterophorus* (Asteraceae).

J.C. 'ZOO' LE SOUËF MEMORIAL AWARD

Nominations for the 2005 award are now invited. Details of Background, nomination, etc. were published in the December 1992 issue of the *Victorian Entomologist* and reproduced in the February 1996 Issue of the *Victorian Entomologist*. These details are also available on the Society's web site <http://www.vicnet.net.au/~vicento>. Nominations must reach the Council at the following address by 30 September 2005:

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66 Wiltonvale Avenue, Hoppers Crossing 3029

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CONTRIBUTIONS TO THE VICTORIAN ENTOMOLOGIST

The Society welcomes contributions of articles, papers or notes pertaining to any aspect of entomology for publication in this Bulletin. Contributions are not restricted to members but are invited from all who have an interest. Material submitted should be responsible and original. The Editor reserves the right to have articles refereed. Statements and opinions expressed are the responsibility of the respective authors and do not necessarily reflect the policies of the Society.

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Contributions may be typed on A4 paper or *preferably* sent to the Hon. editor on an IBM formatted disk in *Microsoft Word for Windows*, *WordPerfect* or any recognised word processor software with an enclosed hard copy. Contributions may also be E-mailed to Internet address: suturalis@yahoo.com

The deadline for each issue is the third Friday of each odd month.

The Society's Home Page on the World Wide Web is located at:

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DIARY OF COMING EVENTS

Friday 15 April AGM

Annual General Meeting and Presidential Address by Peter Marriott on the History of the Entomological Society of Victoria.

Also a short presentation by Peter Carwardine on the life history of the Processionary Caterpillar *Trichiocercus sparshalli*, THAUMETOPOEINAE, NOTODONTIDAE

Friday 20 May Council Meeting

Friday 17 June

Presentation on Day flying Lepidoptera (including new species of Brachodids) by Axel Kallies

Friday 15 July Council Meeting

Friday 19 August

Members' night - short presentations by members

Scientific names contained in this document are *not* intended for permanent scientific record, and are not published for the purposes of nomenclature within the meaning of the *International Code of Zoological Nomenclature*, Article 8(b). Contributions may be refereed, and authors alone are responsible for the views expressed.